AGS/RHIC

Issued: May 24, 2000

***R**adiation*

***S**afety*

***C**ommittee*

Minutes of Commitee review of April 13, 2000

Review of BAF Shielding Design for Upstream Tunnel Section

Present: D. Beavis, A. Etkin, A. Stevens, D. Phillips, L. Ahrens, R. Prigl, J.W. Glenn, M. Zarcone

A design for the shielding in the stub tunnel and the upstream service tunnel was presented (see attachment 1). The design is based on allowing personnel in the BAF tunnel near the dipoles while high intensity protons are in the booster. The stub tunnel shielding design has staggered concrete walls. The beam transport has a steel plug 12 inches in diameter to mask the 8-inch diameter hole in the concrete wall. A gate will be placed between the concrete wall and the dipoles to exclude personne from entering the upstream section.

Faults in the booster can cause substantial radiation into the BAF tunnel. The gate to isolate the upstream portion must have two independent interlocks and represent a complete barrier. **(CK-BAF-4)**

The calculations conducted identify beam faults on the D6 septum as creating the largest radiation levels in the BAF tunnel. Comparisons have been made between a fault study conducted this year and the model calculations. The calculations appear to give absolute values of 1000 times larger then the fault study. The model does not have the correct geometry in the booster tunnel, which may account or the large difference. Ratios of the radiation levels of the two chipmunks in the BAF tunnel used for the fault study agree within a factor of two with the model calculations. This suggests the problem with the model is the geometry used in the Booster. The neutron flux into the BAF tunnel is dominated by the penetration for the beam transport. The radiation levels approximately 2 feet off axis are a factor of 35 lower than the penetration. This means that the neutrons may be very directional and the steel plug and its interlocks need to be carefully considered. **(CK-BAF-5)**

The dose rates at the gate and the exit labyrinth have been calculated using the model and a booster intensity of 72 TP per second. The gate in the BAF tunnel would have levels of 78 rem/hr or 22 mrem/sec. The gate at the exit labyrinth would have levels of 570 mrem/hr or 0.3 mrem/sec. These levels are expected to be severe overestimates as discussed above. When the D6 septum is placed in the Booster a fault study should be conducted. **(CK-BAF-6)** A fixed aperture (5 inch diameter) collimator at the booster side of the BAF penetration is expected to be installed and reduce levels further. Additional calculations including the fixed aperture collimator and a better representation of the source geometry will be conducted. One or two chipmunks should be considered to limit the potential dose during a fault. **(CK-BAF-7)** The dose rate at the BAF target room is estimated to be a factor of 7000 lower than the gate near the dipoles. The fault study should ensure that the levels in the target room allow it to be an uncontrolled area if BAF is not operating. **(CK-BAF-8)**

The shielding calculations for losses of the BAF beam at the dipole bend were presented. The expected maximum beam intensity is 10^{11} p/s. A 10% loss at the dipoles will create 0.1 mrem/hr at the outside labyrinth gate. This assumes that it is not possible for the proton intensity to increase to the value of 10^{14} p/s. For ion beams this is not an issue. For proton beams the method to keep the intensity low will require review. **(CK-BAF-9)**

Attachments:
1. Memo R. Prigl to RSC April 10, 2000.